

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of: Day et al.

Serial Number: 10/606,582

Filed: June 26, 2003

For: SYSTEM AND METHOD FOR
TRACKING MESSAGES BETWEEN A
PROCESSING UNIT AND AN EXTERNAL
DEVICE

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Group Art Unit: 2181

Examiner: Ernest Unelus

Commissioner of Patents and Trademarks
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on: January 11, 2008

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APPLICANTS' APPEAL BRIEF

Applicant-inventors ("Applicants") and assignee International Business Machines Corporation respectfully submit the present brief in support of the patentability of the claims of the above-referenced application.

I. REAL PARTY IN INTEREST

The real party in interest is International Business Machines Corporation, of Armonk, New York, assignee of the interests in the invention from the named inventors.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF CLAIMS

Claims 20-35 are pending. Of these, Claims 20 and 28 are independent Claims. Applicant has cancelled Claims 7-13 and 15-18. Applicant has withdrawn Claims 1-6, 14, and 19. Applicants appeal the Examiner's rejections of Claims 28-35 under 35 U.S.C. §101 and Claims 20-35 under 35 U.S.C. §103(a) and §112, first paragraph. Applicants also appeal the Examiner's objections to the drawings under 37 CFR 1.83(a).

IV. STATUS OF AMENDMENTS

The Claims stand as amended in the Response to an Office Action dated April 23, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention under examination is directed to passing messages to/from an external device to a PU, specifically, passing messages relating to monitoring registers for expected data. *See* Application, Page 1, Lines 5-7. In the prior art, the OS or some active program runs a poll loop to keep reading an event register in virtual memory, until the event that the PU is waiting for occurs. *See* Application, Page 1, Lines 10-15. But some PUs only have access to local memory, and not virtual memory. *See* Application, Page 1, Lines 19-20. Because only local memory can be accessed by load/store operations, the available working memory is limited where the PU has to keep some local memory dedicated to holding an event register. *See* Application, Page 1, Lines 20-27.

The present invention solves this problem by tracking events in read and write channel count registers. *See* Application, Page 3, Line 30 to Page 4, Line 1; and Page 7, Lines 5-10. The PU communicates with external devices through channel registers, each of which operate in only one direction (read or write). *See* Application, Page 3, Lines 24-30. First, the PU decrements the counters when it has processed whatever messages are going to/from the external device. *See* Application, Page 4, Lines 17-20; Page 8, Lines 1-4. For a read, the PU decrements the read channel counter when the read data is processed. *See* Application, Page 9, Lines 1-3. For a write, the PU decrements the write channel counter when the outgoing data is sent to the external device, that is, when the PU writes to that channel. *See* Application, Page 8, Lines 23-24. The external device sends signals when it sends/receives information. *See* Application, Page 9, Lines 4-13.

The Claims embody the invention as follows:

Claim 1: A method for tracking communications between a processing unit (PU) and an external device (ED), comprising:

- receiving, by the PU, data from the ED, into a read register;
- sending, by the PU, data to the ED, from a write register;
- incrementing a read channel count upon receipt of inbound data from the ED by the PU;
- issuing a read channel instruction to decrement the read channel count upon processing of received inbound data by the PU;
- incrementing a write channel count upon receipt of outbound data from the PU by the ED;
- issuing a write channel instruction to decrement the write channel count upon transmission by the PU of the outbound data to the ED;
- accessing the read channel count; and
- comparing the accessed read channel count with a predetermined range to determine whether the PU has received data from the ED.

Claim 21: A computer program product for tracking communications between a processing unit (PU) and an external device (ED), the computer program product having a computer-readable medium with a computer program embodied thereon, the computer program comprising:

- computer code for receiving, by the PU, data from the ED, into a read register;
- computer code for sending, by the PU, data to the ED, from a write register;

computer code for incrementing a read channel count upon receipt of inbound data from the ED by the PU;
computer code for issuing a read channel instruction to decrement the read channel count upon processing of received inbound data by the PU;
computer code for incrementing a write channel count upon receipt of outbound data from the PU by the ED;
computer code for issuing a write channel instruction to decrement the write channel count upon transmission by the PU of the outbound data to the ED; and
computer code for accessing the read channel count; and
computer code for comparing the accessed read channel count with a predetermined range to determine whether the PU has received data from the ED.

VI. GROUND OF REJECTION TO BE REVIEWED

Whether Claims 28-35 constitute statutory subject matter under 35 U.S.C. §101.

Whether Claims 20-35 comply with the enablement requirement of 35 U.S.C. §112, first paragraph.

Whether Claims 20-35 are patentable over Young (US 6,408,354) in view of Stuber et al. (US 6,801,972) under 35 U.S.C. §103(a).

VII. ARGUMENT

A. Grouping of Claims

Claims 20 and 28 are independent. For purposes of this appeal, Applicants consider each of the independent Claims, and their respective dependent Claims, as separate groups. Thus, the groups of Claims are 20-27 and 28-35.

B. Summary of Pertinent Prosecution

The present application was filed on June 26, 2003, with 19 claims. In response to a Restriction Action, Applicants elected to prosecute Claims 7-13 and 15-18 in a Response dated October 12, 2006.

The Examiner mailed the first substantive Office Action on December 4, 2006 ("First Action"), rejecting Claims 7 and 15-18 under 35 U.S.C. §101 as allegedly lacking a tangible result. *See* First Action, Page 3. The Examiner also rejected 12-13, 17, and 18 under 35 U.S.C. §101 as allegedly directed to non-statutory subject matter. *See* First Action, Page 4. The Examiner also rejected Claims 7-13 and 15-18 under 35 U.S.C. §102(b) as allegedly anticipated by Van Loo (US Pub. 2002/0032796).

Applicants responded on March 4, 2007, cancelling Claims 7-13 and 15-18 and replacing the cancelled Claims with new Claims 20-35. In an Advisory Action mailed March 21, 2007, the Examiner refused the amendment as allegedly non-responsive. In a Telephone Conference on April 17, 2007, Applicants' representative and the Examiner agreed on the language, "comparing the accessed read channel count with a predetermined range to determine whether the PU has received data from the ED" as drawn to the elected species. Applicants filed a revised Response on April 23, 2007, incorporating the agreements in the Telephone Conference.

The Examiner mailed the Final Action that is the subject of this Appeal on July 11, 2007 ("Final Action"). The Examiner rejected Claims 28-35 under 35 U.S.C. §101 as allegedly directed to non-statutory subject matter. The Examiner also rejected Claims 20-35 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the enablement requirement. The Examiner also rejected Claims 20-35 under 35 U.S.C. §103(a) as allegedly unpatentable over Young in view of Stuber. The Examiner also objected to the drawings under 37 CFR 1.83(a) for failing to "specifically disclose an item number for the PU, as claimed." Final Action, Page 2.

This Appeal followed.

C. The Examiner's Rejections

The Examiner rejected Claims 28-35 under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter. *See* Final Action, Page 3. In particular, the Examiner asserts that “The preamble of claim 28 should state ‘a computer-readable storage medium’”. Final Action, Page 4 (emphasis in original).

The Examiner rejected claims 20-35 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the enablement requirement. Specifically, the Examiner asserts that “The applicant’s specification doesn’t clearly illustrate ‘*incrementing a write channel count upon receipt of outbound data from the PU by the ED*’” in that “Fig. 2 of the present invention doesn’t show the ED having or consist [sic] of a counter to be increment [sic].” and “The applicant’s specification doesn’t disclose the ED’s counter.” Final Action, Page 4 (emphasis in original).

The Examiner rejected Claims 20-35 under 35 U.S.C. §103(a) as allegedly unpatentable over Young in light of Stuber. Specifically,

D. The Examiner's Rejections Were Procedurally and Factually in Error

1. The Form and Content of the Examiner's Rejections under Section 101/112, First Paragraph, Were Improper and Insufficient

a. Legal Requirements for a Non-Statutory Invention Rejection

The Manual of Patent Examining Procedure distinguishes between “functional descriptive material” and “nonfunctional descriptive material.” *See* MPEP § 2106.01. “Functional descriptive material consists of data structures and computer programs which impart functionality when employed as a computer component.” MPEP § 2106.01. “Nonfunctional descriptive material includes but is not limited to music, literary works, and a compilation or

mere arrangement of data.” MPEP § 2106.01. Generally, nonfunctional descriptive material, even when “recorded on some computer-readable medium” is non-statutory. *See* MPEP § 2106.01.

Similarly, “computer programs claimed as computer listings *per se*, i.e., the descriptions or expressions of the programs,” are not generally statutory. MPEP § 2106.01(I). But “a claimed *computer-readable medium* encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory.” MPEP § 2106.01(I) (*citing In re Lowry*, 32 F.3d 1579, at 1583-84, 32 USPQ2d 1031, at 1035) (emphasis added).

b. Legal Requirements for an Enablement Rejection

The “enablement requirement” refers to the statutory requirement that the Specification include “the manner and process of making and using the invention”. *See* MPEP §2161; 35 U.S.C. §112, 1st paragraph. The “invention” for the purposes of assessing enablement is “that defined by the claim(s) of the particular application or patent.” MPEP §2164.

The appropriate test for analyzing whether a particular claim satisfies the enablement requirement is “a determination of whether that disclosure, when filed, contained sufficient information regarding the subject matter of the claims as to enable one skilled in the pertinent art to make and use the claimed invention.” MPEP §2164.01. The standard application of this test is known as the “undue experimentation test:” and is stated as, “is the experimentation needed to practice the invention undue or unreasonable?”. MPEP §2164.01 (*citing In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988)). In particular, where the invention is sufficiently described, and a best mode provided, the question of whether a claim meets the

statutory requirements of Section 112, first paragraph, turns on whether one skilled in the art could make and use the claimed invention without *undue* experimentation.

Because some experimentation is clearly recognized in the test, “Detailed procedures for making and using the invention may not be necessary if the description of the invention itself is sufficient to permit those skilled in the art to make and use the invention.” MPEP §2164. In fact, “A patent need not teach, and preferably omits, what is well known in the art.” MPEP §2164.01 (*citing In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991)). As such, in some cases, the description of the invention alone also meets the enablement requirement. Stated another way, “The test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue.” MPEP §2164.01 (*citing In re Angstadt*, 537 F.2d 498, 504, 190 USPQ 214, 219 (CCPA 1976)).

There are several recognized factors used to consider whether experimentation is “undue,” including: the breadth of the claims; the nature of the invention; the state of the prior art; the level of one of ordinary skill; the level of predictability in the art; the amount of direction provided by the inventor; the existence of working examples; and the quantity of experimentation. *See* MPEP §2164.01(a). Consideration of these factors is not a single fact test, and is to be conducted in accordance with the principles outlined in other sections of the MPEP, such as “MPEP §2164.08 (scope or breadth of the claims), §2164.05(a) (nature of the invention and state of the prior art), §2164.05(b) (level of one of ordinary skill), §2164.03 (level of predictability in the art and amount of direction provided by the inventor), §2164.02 (the existence of working examples) and §2164.06 (quantity of experimentation needed to make or use the invention based on the content of the disclosure).” MPEP §2164.01(a) (*citing In re Wands*, 858 F.2d at 737, 8 USPQ2d at 1404.)

c. The Examiner's Stated Grounds Were Insufficient

The Examiner's argument that the Specification fails to provide adequate disclosure rests on the purported failure of the Specification to "clearly illustrate '*incrementing a write channel count upon receipt of outbound data from the PU by the ED*.'" Final Action, Page 4 (emphasis in original). The Examiner stresses that "The applicant's specification doesn't disclose the ED's counter." Final Action, Page 4.

Applicants respectfully note that nowhere do the claims require that the ED, an "external device" to which the invention couples, include a counter. Regarding Claim 20, the element cited by the examiner recites that "a write channel count" is incremented by an unspecified agent, when a particular condition is met, namely, "upon receipt of outbound data from the PU by the ED." Claim 20 on its face does not require that the ED increment the write channel count. To assume otherwise would imply that the condition upon which the write channel count is incremented is "upon receipt of outbound data from the PU by an unspecified recipient". This would require ignoring the plain language of the claim "from the PU by the ED" and instead substituting in an unclear recipient. Applicants respectfully submit that the Examiner's requirement that the Specification disclose an element not found in the Claims is insufficient to support a rejection under Section 112, first paragraph.

Nevertheless, even assuming that the Examiner's reading of the Claims is consistent with the actual Claim language (which Applicants respectfully submit it is not), the Examiner's purportedly insufficiently described element is clearly within reach of one skilled in the relevant art without undue experimentation.

As described above, there are several recognized factors used to consider whether experimentation is "undue," including: the breadth of the claims; the nature of the invention; the state of the prior art; the level of one of ordinary skill; the level of predictability in the art; the

amount of direction provided by the inventor; the existence of working examples; and the quantity of experimentation. *See* MPEP §2164.01(a). The Examiner's stance is that there is insufficient detail shown to enable configuring a device that couples to a PU with a "counter." Applicants respectfully submit that the level of one of ordinary skill in the art, skilled enough to understand the other claim language, is sufficiently high that construction of a simple counter is well within the grasp of one of ordinary skill in the art. Additionally, Applicants respectfully note that in the Final Action, the Examiner did not than provide any evidence or argument to suggest that the Specification fails to provide adequate disclosure without undue experimentation.

Therefore, Applicants respectfully submit that the Specification does provide adequate disclosure to enable one skilled in the art to make and use the invention, without undue experimentation. As such, Applicants respectfully submit that the Examiner's rejections under Section 112, first paragraph, are in error and should be withdrawn.

Finally, regarding the rejections under Section 101, as described above, MPEP Section 2106.01(I) notes that "a claimed *computer-readable medium* encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory." MPEP § 2106.01(I) (*citing In re Lowry*, 32 F.3d 1579, at 1583-84, 32 USPQ2d 1031, at 1035) (emphasis added). Applicants note that this statutory configuration does not require, as the Examiner seems to require, "a computer-readable storage medium." Final Action, Page 4 (emphasis in original). Applicants therefore respectfully submit that the Examiner's grounds for rejection under Section 101 are insufficient and in contradiction to established law and policy, and are therefore clearly erroneous. As such, the Examiner's rejections under Section 101 are also clearly erroneous and should be withdrawn.

**2. The Form and Content of the Examiner's Rejections under Section 103
Were Improper and Insufficient**

a. Legal Requirements for an Obviousness Rejection

The obligation of the examiner to produce reasoning and evidence in support of obviousness is clearly defined at MPEP §2142:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

MPEP §2143 sets out the three basic criteria that a patent examiner must satisfy to establish a *prima facie* case of obviousness:

1. some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
2. a reasonable expectation of success; and
3. the teaching or suggestion of all the claim limitations by the prior art reference (or references when combined).

It follows that in the absence of such a *prima facie* showing of obviousness by the Examiner (assuming there are no objections or other grounds for rejection), an applicant is entitled to grant of a patent. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443 (Fed. Cir. 1992). Thus, in order to support an obviousness rejection, the Examiner is obliged to produce evidence compelling a conclusion that each of the three aforementioned basic criteria has been met.

b. The Examiner's Stated Grounds Were Insufficient

As described above, the Examiner rejects Claims 20-38 35 U.S.C. §103(b) as allegedly unpatentable over Young in view of Stuber. Applicants respectfully submit that these rejections are in error and should be withdrawn.

Regarding Claims 20 and 28 (the independent Claims from which all of the Pending Dependent Claims depend), the Examiner stated that Young discloses:

“an external device (ED) (SCSI module 230 of fig.3. . .)”; Final Action, Page 5;
“ . . . a write register (bi-directional data buffer 345 of fig. 3)”; Final Action, Page 6; and
“incrementing a write channel count upon receipt of outbound data from the PU by the ED (see col. 7, lines 62-63, which discloses, ‘A second counter is incremented as each unit of data is transferred to bi-directional buffer 345’); Final Action, Page 6.

Applicants respectfully submit that the Examiner’s rejection therefore is insufficient on its face. That is, the Examiner’s own characterization of the purported Prior Art, Young, demonstrates that the cited references fail to teach each and every element of the Pending Claims. Specifically, the Examiner suggests that Young teaches “incrementing a write channel count upon receipt of outbound data from the PU by the ED,” that is, using the Examiner’s assignments of the components shown in Young, upon receipt of outbound data from the PU (unassigned) by the SCSI module 230.

But the Examiner assessment of Young directly contradicts the stated element of the Claims. That is, according to the Examiner, Young instead teaches incrementing the write channel count “as each unit of data is transferred to bi-directional buffer 345,” which the examiner characterizes as a “write register.” Final Action, Page 6 (*citing* Young, col. 7, lines 62-63). Accordingly, by the Examiner’s own admission, Young teaches incrementing the write channel count upon receipt of outbound data from the PU by the write register. As recited in the Claims, however, the unique invention embodied therein recites “incrementing a write channel count upon receipt of outbound data from the PU by the ED.” Claims 20, 28. As such, the Examiner’s offered *prima facie* case is insufficient on its face and therefore cannot support a rejection under Section 103. For at least this reason, the Examiner’s rejections under Section 103 are clearly erroneous and should be withdrawn.

Finally, the Examiner offers Stuber as showing “a FIFO or a buffer is a register.” Final Action, Page 7. This offering, even if true, does not provide the missing element contradicted by Young. Accordingly, the Stuber reference likewise fails to teach each and every element of the pending Claims. As such, the Examiner’s proposed combination fails to demonstrate a *prima facie* case, as described above, and therefore cannot support a rejection under Section 103. For at least this reason, the Examiner’s rejections under Section 103 are clearly erroneous and should be withdrawn.

Accordingly, Applicants respectfully submit that the Examiner’s stated grounds are insufficient to maintain the Final Rejection. Applicants therefore respectfully request that the Final Rejections be withdrawn and that Claims 20-35 be allowed.

VIII. CLAIMS APPENDIX

See Attached.

IX. EVIDENCE APPENDIX

NONE.

X. RELATED PROCEEDINGS APPENDIX

NONE.

XI. CONCLUSION

For the foregoing reasons, it is respectfully submitted that the Final Rejections of Claims 20-35 under 35 U.S.C. §112, first paragraph, and §103(a) and of Claims 28-35 under 35 U.S.C. §101 are improper and should be reversed. Applicants respectfully request that the rejections of Claims 20-35 be withdrawn and that Claims 20-35 be allowed.

Applicants hereby authorize the Director to charge the required fee for the filing of this Appeal Brief to Deposit Account No. 50-0605 of CARR LLP. Applicants hereby request an extension of time for filing this Appeal Brief and hereby authorize the Director to charge the required fee to Deposit Account No. 50-0605 of CARR LLP. Applicants do not believe that any other fees are due; however, in the event that any other fees are due, the Director is hereby authorized to charge any required fees due (other than issue fees), and to credit any overpayment made, in connection with the filing of this paper to Deposit Account No. 50-0605 of CARR LLP.

Respectfully submitted,

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VIII – APPENDIX – CLAIMS ON APPEAL

1. (Withdrawn) A system for use by a PU (processing unit) in communicating externally in a symmetrical multiprocessor system, comprising:

PU issue and control logic means;

PU data flow means interconnected to the PU issue and control logic means;

PU channel logic means interconnected to the PU issue and control logic means and the PU data flow means, wherein said PU channel logic means includes:

channel read data means and channel write data means interconnected between the PU data flow means and the PU channel logic means;

channel and data input and output port means interconnected to the PU channel logic means;

channel stall signal output means interconnected from the PU channel logic means to the PU issue command control logic means; and

channel instruction means interconnecting the PU issue and control logic means to the PU channel logic means.

2. (Withdrawn) The apparatus of claim 1, comprising in addition:

means for keeping track of the number of communications pending with said specified device; and

means for modifying further PU actions when the number of communications with said specified device reaches a given predetermined number.

3. (Withdrawn) The apparatus of claim 2 wherein the means for modifying PU action operates to prevent further communication with said specified device until the number of communications with said specified device is caused to be altered.

4. (Withdrawn) The apparatus of claim 1, comprising in addition:

means for assigning a channel for communications with a given external device;

means for placing communications for said given external device in a given storage means;

means for tracking the number of communications, for a given one of read or write instructions, from a PU to a given external device in a given counter associated with said channel that has been assigned;

means for tracking the number of communications, for said given one of read or write instructions, to the PU from the given external device to alter the count in the counter in a direction opposite from the counter movement when said instructions are sent from the PU; and

means for validating data in said given storage means when the count for said channel is at a given value.

5. (Withdrawn) The apparatus of claim 1, comprising in addition:
means for maintaining a count of register inputs versus outputs; and
means for retrieving data as valid when the count is other than a given predetermined value.

6. (Withdrawn) The apparatus of claim 1, comprising in addition:
means for maintaining a count of register inputs versus outputs; and
means for preventing further writing of data into said register when the count reaches a given predetermined value.

7. – 13. (Cancelled)

14. (Withdrawn) A microprocessor, comprising:
read channels;
write channels;
incoming data counting mechanisms for at least some of said read and write channels;
and
instruction processing means responding to external device generated instructions requesting a determination of the count in said data counting mechanism of at least one of said write channel and read channels having counting mechanisms.

15. – 18. (Cancelled)

19. (Withdrawn) Apparatus for transmitting data between a PU and an external device, comprising:

- a data storage register;
- means, comprising a part of said register, operable to accumulate data received from multiple writes directed to said register; and
- means, comprising a part of said register, operable to transmit all data accumulated in said register in response to a single received read instruction.

20. (Previously Presented) A method for tracking communications between a processing unit (PU) and an external device (ED), comprising:

- receiving, by the PU, data from the ED, into a read register;
- sending, by the PU, data to the ED, from a write register;
- incrementing a read channel count upon receipt of inbound data from the ED by the PU;
- issuing a read channel instruction to decrement the read channel count upon processing of received inbound data by the PU;
- incrementing a write channel count upon receipt of outbound data from the PU by the ED;
- issuing a write channel instruction to decrement the write channel count upon transmission by the PU of the outbound data to the ED;
- accessing the read channel count; and
- comparing the accessed read channel count with a predetermined range to determine whether the PU has received data from the ED.

21. (Previously Presented) The method as recited in Claim 20, further comprising associating an active channel with the read register and the write register.

22. (Previously Presented) The method as recited in Claim 21, wherein issuing a write channel instruction further comprises writing data externally to the PU.

23. (Previously Presented) The method as recited in Claim 21, wherein issuing a write channel instruction further comprises writing data to an internal register of the PU.
24. (Previously Presented) The method as recited in Claim 21, wherein issuing a read channel instruction further comprises returning read data to a PU dataflow.
25. (Previously Presented) The method as recited in Claim 20, further comprising associating a passive channel with the read register and the write register.
26. (Previously Presented) The method as recited in Claim 25, wherein issuing a write channel instruction further comprises storing write data locally for an external read operation.
27. (Previously Presented) The method as recited in Claim 25, wherein issuing a read channel instruction further comprises returning read data to a PU dataflow.
28. (Previously Presented) A computer program product for tracking communications between a processing unit (PU) and an external device (ED), the computer program product having a computer-readable medium with a computer program embodied thereon, the computer program comprising:
- computer code for receiving, by the PU, data from the ED, into a read register;
 - computer code for sending, by the PU, data to the ED, from a write register;
 - computer code for incrementing a read channel count upon receipt of inbound data from the ED by the PU;
 - computer code for issuing a read channel instruction to decrement the read channel count upon processing of received inbound data by the PU;
 - computer code for incrementing a write channel count upon receipt of outbound data from the PU by the ED;
 - computer code for issuing a write channel instruction to decrement the write channel count upon transmission by the PU of the outbound data to the ED; and
 - computer code for accessing the read channel count; and

computer code for comparing the accessed read channel count with a predetermined range to determine whether the PU has received data from the ED.

29. (Previously Presented) The computer program product as recited in Claim 28, further comprising computer code for associating an active channel with the read register and the write register.

30. (Previously Presented) The computer program product as recited in Claim 29, wherein issuing a write channel instruction further comprises writing data externally to the PU.

31. (Previously Presented) The computer program product as recited in Claim 29, wherein issuing a write channel instruction further comprises writing data to an internal register of the PU.

32. (Previously Presented) The computer program product as recited in Claim 29, wherein issuing a read channel instruction further comprises returning read data to a PU dataflow.

33. (Previously Presented) The computer program product as recited in Claim 28, further comprising computer code for associating a passive channel with the read register and the write register.

34. (Previously Presented) The computer program product as recited in Claim 33, wherein issuing a write channel instruction further comprises storing write data locally for an external read operation.

35. (Previously Presented) The method as recited in Claim 33, wherein issuing a read channel instruction further comprises returning read data to a PU dataflow.